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egyptian environmental policy program planning for integrated air quality management

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Preface

This report describes work performed through one activity under the Egyptian Environmental Policy Program. In some ways, this work could be considered a natural follow-on to work started, knowledge gained, and programs created under the Cairo Air Improvement Project. Yet certain tasks, namely developing the Air Quality Strategy Framework and related analyses, required a large number of new partners and technical disciplines to be involved. Overall, EEPP-Air supports sustainability and expansion of CAIP and other Egyptian government initiatives, but as importantly, provides Egypt with crucial tools and policy measures for broader environmental management.

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Moving Egypt's Air Pollution Policy Forward

A decade ago, the Egyptian government was making several serious commitments in environment protection. At the same time that the country's comprehensive environmental law was coming into force, Egyptian and US specialists were finalizing the first health-based assessment of environmental degradation. The results, showing that air pollution caused diseases leading to thousands of premature deaths, impaired child development, and lost worker productivity, were instrumental in guiding local and international donor planning efforts to counter the problem.

The Cairo Air Improvement Project (CAIP), a major investment by both USAID and the Egyptian government, became the focal point for air pollution control activity in Egypt for nearly seven years, coming to a close in March 2004. Through CAIP's technical, institutional, and awareness raising activities, many important outcomes were achieved. CAIP's analyses documented measurable reductions in lead pollution and the number and severity of seasonal air pollution episodes. At the same time, long-term programs were created for vehicle testing and tune-up, clean vehicle fuels, and lead smelter upgrade and relocation, to continue well beyond the project. CAIP's air monitoring and awareness raising activities underpinned the different pollution control interventions but also achieved broader benefits. [See the CAIP Final Report for more details.]

For sustained impact, additional work was called for to complement CAIP's "bottom up", implementation-based approach. Beginning in 1999, USAID and the Egyptian government had also launched the Egyptian Environmental Policy Program (EEPP) to lay down policy elements essential to Egypt's environmental management agenda. EEPP was designed as a cash-transfer, policy reform program providing broad support to the environmental sector in Egypt.

The EEPP Air Activity (EEPP-Air) was intended to address air quality objectives somewhat independent of CAIP but also to solidify policy enhancements supporting CAIP achievements. It came on line in mid-2003 and was implemented by many of CAIP's specialists augmented with experts specific to the policy work at hand.

As of this writing, EEPP-Air's targets have largely been achieved. Since the design of USAID's technical assistance program fosters the Egyptian government's ability to achieve reforms after technical assistance support has ended, some work by project

partners continues through summer of 2004. The following sections describe the work of EEPP-Air and how it was accomplished.

EEPP-Air In Brief

Scope of Activities

The Air Activity under the Egyptian Environmental Policy Program covered one of EEPP's ten overall "policy objectives", fostering improved air quality. Other objectives encompassed policy interventions in a variety of disciplines, including: solid waste, energy, Red Sea conservation, and broad environmental management.

The three policy measures to be achieved under EEPP-Air were:

1. The Egyptian government adopts high priority National Air Quality Strategy components.
2. The Governorate of Cairo requires a portion of new municipal transit buses in Cairo to use CNG.
3. The Governorate of Qalyubia institutes policy measures to mitigate the environmental impact of lead smelting operations in Shoubra El Kheima.

The design of EEPP included two cash transfer tranches. EEPP-Air was implemented during the Tranche 2 portion of the program. Partners for the activity and outputs are described at the end of this document.

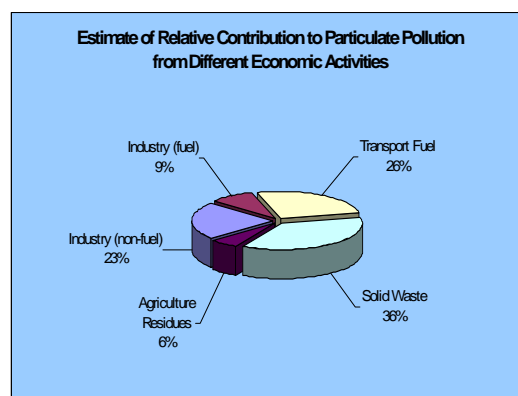
Some Key Findings for Policy-Makers

1. Air pollution costs the Egyptian economy at least \$1.3 billion annually in health costs. However, investing \$500 million to combat it over ten years, will reduce these health costs by an estimated \$5 billion over the same ten years, a 10-fold return on the investment.
2. The priority pollutant is fine particulate matter, representing 96 percent of the total economic cost of air pollution.
3. The Awadallah smelter site in Shoubra El Kheima poses a significant threat to the residents of the area. More than 80 percent of small children and 100 percent of adults in the worst areas have levels of lead in their blood exceeding international thresholds.
4. New, locally developed options to expand CNG in transit buses have radically altered the economic feasibility of conversions. For two percent of its annual bus overhaul budget, the largest public transit company plans to add 25 to 50 CNG buses annually.
5. A program to convert government vehicles to CNG has been highly successful. Already about 250 vehicles have been converted.

An Integrated Framework for Air Quality Management

Air quality management in any setting presents a daunting challenge—hundreds of pollutants released by millions of individual sources. Variability in meteorology, in local terrain, and in the pollutant sources themselves can produce tremendous changes in pollution levels from one day to the next or even from one neighborhood to the next. The progressive rise in population and development mean the overall trend with time is often upward. In Egypt, natural factors including the dusty environment and lack of rainfall only serve to aggravate the impacts of man's activity.

The complexity of air pollution sources points to the complexity of the solution. Under Egyptian environmental law, the Ministry of State for Environmental Affairs and the Egyptian Environmental Affairs Agency (EEAA) coordinate and oversee many key programs. However, dozens of other government ministries and agencies have pivotal roles in diagnosing and addressing environmental problems. And government is only one of the three required sets of players—business and the public at large have major roles as well.



EEPP-Air defined the contribution of different economic activities to pollution—a basic need for any decision-making.

At the same time, mechanisms for bringing the various stakeholders are quite new and not yet complete. Reliable information and analysis with which to plan and make decisions was a tremendous need recognized in the early 1990s, and this need has only been addressed by the government in the last few years, supported by CAIP and other programs.

The Solution

Clearly one of the most complex activities under EEPP-Air, policy work in this area combined technical analysis, stakeholder identification, and a participatory process to create a framework Egypt will use to guide its air pollution program in years to come.

Problem diagnosis—defining the current status of air quality

Understanding the exact nature and sources of air pollution is a logical precursor to a solution. In contrast to the state in the early 1990s, a great deal of air quality data is now available through CAIP and the Danish Environmental Information and Monitoring Programme (EIMP). Other data, primarily from the Ministry of Health, was available previously but never brought together with other information sources.

EEPP-Air integrated all available data to provide the most complete analysis of air pollution status and trends available in Egypt. The analysis demonstrated the significance of particulate matter versus other pollutants in greater Cairo, in terms of the frequency of exceeding Egyptian air quality standards. The project then used industry information from the Egyptian statistical bureau (CAPMAS) to develop the first inventory of estimated particulate matter emissions for greater Cairo. While this is only an initial prototype for a much more extensive effort, it provided an indication of the top industrial sources of this target pollutant—vital information for action planning.

Defining health and economic consequences

In 1994, a USAID-funded comparative risk analysis made excellent use of limited data to define and rank the estimated health consequences of various environmental problems, including air pollution. With extensive additional data available, EEPP-Air conducted a reassessment of air pollution health risks. The results, which are estimates based on internationally accepted mathematical modeling techniques, present a very serious picture of the impacts of air pollution in greater Cairo:

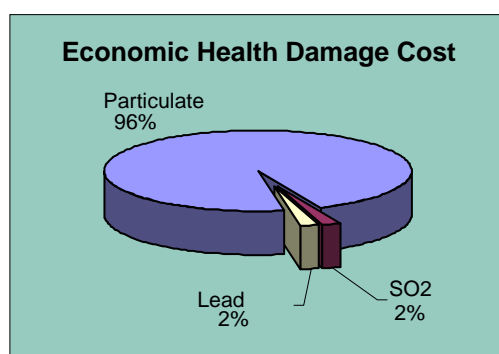
- ❑ At least 6,000 premature deaths annually
- ❑ At least 5,000 excess cancer cases over the lifetimes of current Cairo residents
- ❑ Reduction in child IQ by 2 points (actually improved since the 1990s, due to pollution mitigation measures)
- ❑ Approximately 35,000 additional hospital admissions annually due to respiratory and heart diseases
- ❑ Six million working days lost annually by Cairo's workforce due to illness

An economic valuation effort put the health risk conclusions in terms of cost to the Egyptian economy and updated previous analyses:

- ❑ \$1.3 billion or more annually from particulate matter

- ❑ \$26 million or more annually from sulfur dioxide
- ❑ \$25 million or more annually from lead

This same analysis presented scenarios showing the return to the Egyptian economy from different monetary investments in pollution control—for example, the economic benefits of reducing pollution by 10 or 20 percent. This was the first analysis in Egypt demonstrating that investments in pollution abatement reap much greater economic returns.



The economic valuation of health risks clearly demonstrated the significance of particulate matter versus other pollutants..

Team approach fosters ownership and builds capacity

The team approach for conducting the above technical analyses actively engaged specialists at EEAA to contribute their expertise in air quality data analysis. At the same time, formal training sessions and less formal seminars and discussions developed new capacity in areas never tackled significantly by local specialists—topics like health risk modeling, applied econometrics and statistical analysis, and spatially-referenced pollutant mapping.

Ensuring solid management targets—air standards

Egypt's air quality strategy must have measurable goals. These goals are typically legal limits on the amount of air pollutants allowable in order to be protective of public health and welfare. Limits are set for ambient air—the air outdoors that we breathe—and for pollutants emitted from industry and other sources.

EEPP-Air engaged US experts to evaluate current Egyptian pollutant standards for ambient air and the emissions of lead from factories. The experts advised an EEAA-led panel of local experts charged with reviewing the limits. Following several consultative sessions, revised limits have been approved by the EEAA Board of Directors and are working their way to the office of the Prime Minister to be put into force.

The analyses performed here reflected a standard-setting process performed in the US and elsewhere that addresses health consequences, technical feasibility, economic cost, social issues, public opinion, and other factors. EEPP-Air introduced this process to the EEAA standards committee to empower them to carry it forward in the future.

An air quality framework to guide future action

As originally conceived, the government, with support of EEPP-Air, would devise a broad framework to guide the further development of an air quality strategy. Expectations were somewhat modest on the ability to engage stakeholders in detailed discussions of polluting sectors and specific strategies to address them. We believe what was created goes beyond an actual strategy framework and puts the Egyptian government on a path to action planning.

Starting with the strong foundation (above) of problem diagnosis and priority ranking of pollutants and their sources, the framework process was easily focused in four economic sectors contributing the bulk of Egypt's pollution:

- ❑ vehicles
- ❑ industry
- ❑ solid waste
- ❑ agricultural waste

Two challenges arose at the early stages. First, while officials at the environmental agency well understand their positions and functions of the agency, they—reinforced by the media and even other elements of the government—are sometimes left feeling solely responsible for environmental protection. At the same time, other stakeholders are not at the same level of accepting their roles in air quality management. Environmental protection has in most cases not been part of their mandate in the past.

Ultimately, with the firm commitment of the Minister of Environment, the stakeholder analysis was brought into action. Officials in more than a dozen ministries and other institutions were brought into working group meetings and larger participatory workshops to devise sector-specific policies and actions to mitigate air pollution.

EEPP-Air and the sector working groups prepared several new analyses to inform the technical scope of pollution abatement interventions, roles and responsibilities, schedules, and anticipated barriers and constraints. The team also integrated existing sector and cross-sector strategies and action plans for the first time to ensure the entire approach was coordinated nationally. Examples of other efforts integrated include the national environmental action plan, national solid waste strategy, energy and environment strategy, natural gas master plan, and the transportation master plan. In priority areas such as agricultural waste management and industrial relocation, framework development transitioned to action planning, detailing specific interventions the government is able to push forward in the upcoming months.

A New Plan for Disseminating Air Quality Information

Factual, understandable information and analysis are crucial to moving the air pollution agenda forward in Egypt. Under Law 4 for the Environment, one of the chief roles of EEAA is the collection, analysis, and dissemination of environmental information, including air quality data.

Prior to the late 1990s, very little air quality information existed in a form that could be used for management. Donor programs, including USAID's CAIP and Danida's EIMP activities changed this substantially by funding environmental monitoring networks and supporting EEAA in developing analytical and reporting capability. Efforts under EEPP-Air's Air Quality Strategy Framework development process went further in gathering data from other local partners and integrating all available sources.

Also supporting local capacity development was CAIP's public awareness and communications component, which fostered general air quality awareness as well as awareness and acceptance of CAIP's interventions. However, despite successful collection, analysis, and focussed communications of air quality information, an integrated and long-range plan for disseminating information to various audiences was needed.

The Solution

A plan for disseminating air quality information is essential for EEAA to fulfill its legally mandated role to produce and distribute environmental information to various stakeholders. It is also essential for the successful implementation of an air quality strategy.

In addition to relying on knowledge and experience gained through CAIP, the plan development team reached out to prime recipients of environmental information, the news media. In one-on-one sessions and broader media roundtables, plan developers described the objectives of the planning effort and solicited comments about what information the media lacked, questions and misperceptions they held, and methods for packaging information. Developers also met with environmental agency managers to solicit their opinions on types of information available, audiences, and channels for communicating the information.

The final plan, already being implemented, defines audiences ranging from the government to the media and general public and defines messages and information types appropriate for each. Channels of communication, from the mass media to the EEAA web site and hotline are identified for communicating information in the near and longer-terms. Finally, the plan defines roles and responsibilities and the specific process for each dissemination activity.

Perhaps the most remarkable aspect of the plan, which is also the one that has been implemented, calls for the regular dissemination of an air quality forecast to Cairo's public. This element, which carries a significant commitment by the Minister of Environment, is the culmination of years of work and investment. It brings in predictions of the "early warning system", a unit in EEAA led by Egyptian meteorologists and which uses data from donor funded air monitoring networks. The unit was started with CAIP support in 2000. Beginning in June 2004, a simplified "index" of pollution—good, moderate, or high—with associated explanation, was recorded for broadcasting to Cairo citizens through a morning television program. Plans to expand coverage to other outlets are underway.

Good



Moderate



High



EEAA has used experience with its air pollution forecasting system to develop a simple daily message on air pollution, now reaching the public through television.

Expanding Clean Alternative Fuels

The use of clean alternative fuels is one of the pillars of vehicle pollution control in virtually any air quality management program around the world. In Egypt, the use of compressed natural gas serves national energy security interests as the country has abundant supplies of this resource and dwindling supplies of petroleum products.

In the short time since the late 1990s, Egypt has made great strides in the use of natural gas as a vehicle fuel. With more than 50,000 vehicles now operating on CNG, Egypt ranks eighth worldwide, a number that would be even higher if the number of CNG vehicles was compared to total vehicles on the road in the country. In recognition of Egypt's commitment to advancing its alternative fuels program, the Minister of Petroleum and Governor of Cairo were this year presented with the international Clean Cities award by the US Department of Energy's Clean Cities program.

Much of Egypt's success has been with the conversion of gasoline vehicles to CNG, where a fuel price difference favors the switch. Success predominates with private taxis, where fuel price directly affects income.

Conversion of other vehicles has been the challenge. On one front, large fleets of government gasoline vehicles pose a significant source of pollution, but fleet managers have less of the acute economic concerns to drive the conversions to CNG based on fuel price alone. In addition, diesel vehicles, while representing a very significant source of hazardous pollutants, are known to be expensive and more technically challenging to convert. Subsidized diesel prices also create a less favorable climate for diesel to CNG conversions.

The Solution

EEPP-Air worked on two parallel tracks to support programs converting government vehicles to CNG as well as to expand CNG in public transit buses given existing installed infrastructure to support it.

The government's participation

Beginning several years ago, the Ministry of Environment and EEAA saw a problem. While CNG vehicles were becoming more prevalent on the streets of Cairo, most were private vehicles—the government should be doing more. Working through this,

agency representatives found they would be able to obtain funding through the Ministry of Finance for a government conversion program. With some *ad hoc* support previously from CAIP specialists, EEAA put in place a plan to convert several thousand vehicles, with a first year budget from the government of 13 million Egyptian pounds.

EEAA now heads a standing committee that meets regularly to oversee, monitor, and make critical decisions on the course of the program. EEPP-Air provided a representative to this committee.

The results are impressive. In the first year of the program about 250 Government vehicles have been converted and 300 more have been identified for conversion in the next few months. Five vehicle conversion companies (including three new private sector companies) sit on the planning committee and each has a share of the government fleet conversions.

Conversion of public transit buses to CNG

Cairo's two main public transit companies, the Cairo Transit Authority (CTA) and Greater Cairo Bus Company (GCBC) now have substantial CNG bus experience. They have operated CNG buses since 1996, with the bulk of their experience coming from the CAIP-funded fleet of 50 buses. Accompanying these is the infrastructure to support a total of 400 buses in the two companies.

Independent of donor program activities, CTA has for several years maintained a CNG Committee, mandated to conduct analyses of CNG performance and experience, and advise top management on future procurement decisions. Although experience with CNG buses has been positive, and capacity and infrastructure are in place to support fleet expansion, two obstacles loom over any plans to expand the fleet. The first is the serious and on-going budget pressure on CTA, limiting their ability to afford the purchase, operation, and maintenance of more



The CNG logo carried by transit buses in Cairo will appear on at least 25 buses annually based on a plan prepared with EEPP-Air support.

expensive CNG buses. The second is the lack of sustainable technology supply options—local manufacturers, the key to affordable supply, have had few opportunities to develop their products.

However, it is now clear these problems can be surmounted. Through numerous discussions and assessments of options EEPP-Air has worked with CTA to put in place a CNG conversion plan that:

- ❑ *Makes a firm commitment to add 25 buses to the fleet this year.* Egyptian and US technical specialists produced enhanced technical specifications for a local CTA tender issued in late May. Bids are now under evaluation and CTA, in accordance with policy steps outlined under EEPP, intends to award a contract in late summer 2004.
- ❑ *Fulfills a commitment by the Cairo governor to continue adding buses annually.* Through significant analysis and lessons learned, CTA has negotiated an arrangement with a local company to convert buses as part of CTA's annual fleet overhaul effort. Instead of furnishing a certain percentage of the fleet with new diesel engines, some of these buses will be completely repowered to CNG for less than one-tenth of the price of a new CNG bus. Fifty buses could be converted to CNG annually for about two percent of the overhaul budget—certainly an affordable option for bus company top management.
- ❑ *Fosters development of local CNG technology suppliers.* The current procurement of 25 buses and the upcoming repowering effort will greatly enhance the ability of local companies to supply CNG bus technology. When this is in place, CTA will take additional steps to require private sector transit companies operating under CTA's oversight to use CNG.

Lead Smelter Pollution: Local Solutions and National Policy

Secondary lead smelters are well known to represent a significant source of lead to the environment in Egypt. Since lead has largely been removed from gasoline, smelters are in fact the main source.

The Lead Smelter Action Plan was developed in the mid 1990s by Egyptian and US specialists to guide upgrading and relocation of this industry from densely populated areas of Shoubra El Kheima, a district of Cairo which is also upwind of downtown. The plan also included assessment of the broader picture, from investigating hazards posed by closed factories to defining broader supply and demand issues that inform policy decisions to reduce demand for lead bearing products in the future. The Lead Smelter Action Plan was implemented under CAIP.

Relocating the largest smelter owner's operations had a large, positive impact on air quality, reducing lead in the air by 75 percent. Still, a preliminary assessment of the closed site suggested a substantial problem remained from many years of dirty operations. What began as a concern for air quality quickly became a problem of contamination in multiple environmental media—soil, dust, and water.

The Solution

The solution came on two fronts. The first used an implementation-level case study to put in place capacity for investigating and cleaning up sites. The second created the legal framework to force cleanups and prevent smelters in residential areas in the future.

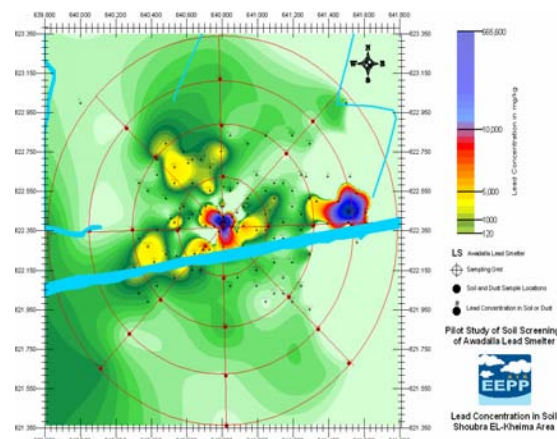
Smelter site characterization

EEPP-Air was tasked with supporting the Egyptian government in something completely new—defining the extent of contamination from a former industrial site, and putting in place a comprehensive plan to clean it up and reduce the threat to health. The work was not simply planning, in that an EEPP requirement compelled the governorate of Qalyubia to demonstrate that the plan was actually being implemented. The work was expected to create a model with which to develop national guidelines intended for other smelter sites.

While previous work defined lead contamination on the smelter property, the impact area in the neighborhood was completely unknown. The study team took a phased approach, first collecting a limited number of soil samples from within a one-kilometer radius of the smelter smoke stack. This and other phases of sampling confirmed that off-site lead contamination was most severe within a few hundred meters of the site, a finding that would control cleanup costs.

Assessing the severity of health impacts to the community

Drawing on experience from the United States, local health specialists performed an assessment of baseline risks, which are potential health impacts on the surrounding community if nothing is done to clean up the site. This internationally recognized method uses a series of mathematical models together with measured levels of pollutants in soil and drinking water to estimate the likelihood of cancer and other effects. Conclusions were that the zone of influence of the smelter posed health risks to children, women, and men, well in excess of levels that would require clean up in other countries.



A map of soil lead concentrations in the area of the smelter site shows “hot spots” of concern and the broad impact of the smelter on the community.

To confirm the estimates of the baseline risk assessment, EEPP-Air designed a simple community health study, in conjunction with local community representatives and the Ministry of Health. The objective of the work was to measure lead in the blood of children and women of child-bearing age—the sensitive groups—along with other residents. Ministry of Health staff collected the blood samples while social workers administered a brief questionnaire. Personal, charitable donations from project staff funded food baskets that were given to these low-income residents in exchange for participating in the study.

The findings of the study were staggering. Every man and woman tested in some areas adjacent to the smelter had blood lead levels in excess of the international health standard. In one area, more than 80 percent of children had levels exceeding

the standard. Significant levels of lead were also found in the breast milk of women in the community.

Findings of these analyses were raised immediately to the Governor of Qalyubia, who organized a meeting in the neighborhood to discuss the problem with local residents and provide them with options for reducing their lead exposure.

Developing the cleanup plan and guidelines

With findings of the health assessment unequivocal, local and US engineers proceeded to finalize cleanup options and their associated costs. The selected option calls for removal of some contaminated soil to a secure landfill, paving various areas to eliminate exposure to residual contamination in soil, and cleaning other areas to reduce direct contact by residents. Understanding the severity of the situation, the Governor has already stepped in with local funds to begin paving dirt roadways in the community.

The entire process, from preliminary assessment under CAIP to the health assessments and remediation planning under EEPP-Air, was used to create a model framework for remediation at other smelters. These national smelter remediation guidelines are in draft form now, to be finalized with the experience gained with site cleanup under the anticipated USAID LIFE project.

New legal requirements complete the policy enhancements

Prior to EEPP, the government had no legal leverage to force industries to clean up pollution they cause. With EEPP-Air, all of this has changed. Two legally binding decrees have been issued by the Governor of Qalyubia, the first banning lead smelters in the area of Shoubra El Kheima altogether, and the second requiring decontamination of all smelter sites by owners. Defining the terms of these decrees required a legal review as to their constitutionality. Even more challenging was obtaining the governorate commitment to an implementation plan. This addressed several difficult and potentially costly issues such as accommodating employees of industries that could no longer be located in the area.

To the Future

EEPP-Air activities ran the gamut, from true policy shifts to more “ground-level” operational accomplishments. It is the former of course that are most difficult to achieve and the impact of which will not be known until after the technical assistance providers have finished.

While achieving the instrument of the policy shift—legal decree, master plan, or written contract for example—poses challenges and can very much fall prey to a lack of political will, we find that this is easier than what follows. Policy reform is by definition change, and implementing such change requires resources. Uniformly, the local partners of EEPP-Air are resource poor.

While the commitment of the Egyptian government to EEPP-Air policy measures is real, ensuring long-term impacts might be supported in future efforts through even more attention to detailing the resources required, bringing them on board, and working thoroughly into the implementation. Activities tending in this direction, such as the start of smelter cleanup, are already reaping benefits.

Final EPPP-Air Reports

All reports are available on CD.

Air Quality Strategy Framework

Ambient Air Quality Criteria Document	March 2004
Lead Emissions Standards Document	March 2004
Air Quality Status Report	March 2004
Air Quality Health Risk Assessment and Economic Valuation Report	March 2004
National Air Quality Strategy Framework	June 2004

Air Quality Information

Air Quality Information Dissemination Plan	June 2004
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Clean Alternative Fuels

CNG Bus Conversion Plan, Cairo Transit Authority	June 2004
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Lead Smelter Pollution

Site Investigation Report: Awadallah Lead Smelter Site	December 2003
Baseline Human Health Risk Assessment: Awadallah Lead Smelter Site	June 2004
Screening Epidemiological Study of Blood Lead Levels in the Vicinity of the Awadallah Lead Smelter Site	June 2004
Remediation Feasibility Study: Awadallah Lead Smelter Site	April 2004
Remediation Plan: Awadallah Lead Smelter Site	April 2004
Draft National Remediation Guidelines for Lead Smelter Sites	June 2004

EEPP-Air Partners

EEPP-Air represented one activity under the umbrella Egyptian Environmental Policy Program, implemented through a grant agreement between the US and Egyptian governments, with funding from USAID. The main implementing partner for EEPP-Air was the Ministry of State for Environmental Affairs, with the Egyptian Environmental Affairs Agency. Other key partners were the Governorate of Qalyubia and the Governorate of Cairo, with the Cairo Transit Authority. Development of the project outputs, especially the Air Quality Strategy Framework, Air Quality Information Dissemination Plan, and various supporting technical analyses for air and lead pollution required the contribution, consultation, and participation of many Egyptian organizations. These are referenced in the respective documents.

EEPP-Air technical assistance was provided through a contract implemented by Chemonics International, with its local partner Chemonics Egypt. Work was begun in April 2003 and completed in June 2004, overlapping with the Cairo Air Improvement Project and using many of the same staff.